

## Software Products

**A VERSATILE NASA-DEVELOPED PROGRAM FINDS SECONDARY UTILITY IN DAIRY MANAGEMENT, E-MAIL AND ARCHITECTURE**

**A**t Cornell University's Department of Animal Science, researcher Dr. Lawrence R. Jones and his colleagues are developing decision support systems to help in management of dairy herds. NASA-developed software is providing an assist.

The dairy industry maintains a nationwide record system — the Dairy Herd Improvement Association — which collects data on dairy herds around the country and processes the information at nine regional centers, one of them at Cornell. Data for groups of herds can be imported into Dr. Jones' system, which is known as MAST.

The goal is to boil the data down to a pool of easily understood information for herd managers. To help them make decisions, MAST draws conclusions from the data and summarizes it graphically. To give the system the ability to make decisions without user interaction, the Jones team uses NASA's CLIPS (C Language Integrated Production System).

Developed by Johnson Space Center, CLIPS is a shell for developing expert systems. It is designed to permit research, development and delivery of artificial intelligence on conventional computers. It is based on an algorithm that enables very efficient pattern matching. A collection of conditions, and the actions to be taken if these conditions are met, is constructed into a rule network. As facts are asserted prior to or during a session, they are matched to the rule network.

In the dairy application, the MAST system with an embedded CLIPS shell analyzes an attribute of milk called "linear score." Linear score is related to udder health and, along with milk production, is measured monthly. The lower the linear score, the better the quality of milk. Using the collected herd data, the program first performs a statistical analysis to determine which parts of the herd are up or down in linear score. These results are passed to

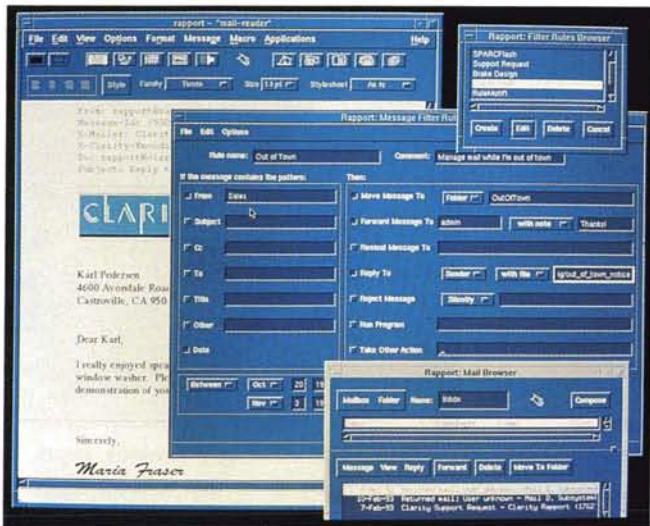
CLIPS, which draws conclusions for the user. Through this technique dairy managers are able to identify herd problems more rapidly and the end result is improved animal health and higher milk quality.

CLIPS was supplied to Dr. Jones by the Computer Software Management and Information Center (COSMIC)® located at the University of Georgia. COSMIC is NASA's mechanism for making available to industry government developed computer programs that have secondary applicability.

The versatility and portability of CLIPS have made it a valuable tool for a wide variety of applications. Another example of how CLIPS is contributing to industrial productivity is its use by Clarity Software, Inc., Mountain View, California. With the help of COSMIC-supplied CLIPS, Clarity has developed a "smart" mail program to meet increasing demand for a simple mail handling program occasioned by the snowballing



152



growth of E-mail; *shown above* is a screen shot illustrating the mail filters in the software product Clarity Rapport.

Clarity's program helps users compose complex rules for managing their E-mail. The user defines rules based on the "header fields" of a mail message — the sender and his title, subject, date and other pertinent data. With a simple graphical interface, the user can then set conditions on the fields, followed by actions to be taken on completion of the conditions. Example: a person going on vacation could set his mail program to filter out junk mail and forward or file other mail depending on its importance.

Clarity saved time and money by using CLIPS rather than developing a comparable

tool. Says company engineer Terry Cline, "Without CLIPS we would have had to write our own rule engine because there were not a lot of tools of this type that could be embedded in an application." Use of CLIPS enabled Clarity to push its product to the market faster and gain a competitive edge.

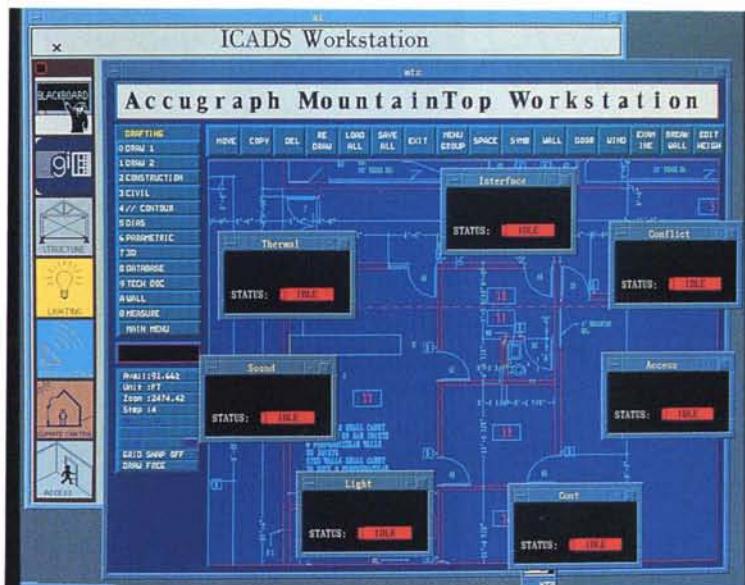
A third example of CLIPS' utility is its use by the CAD (Computer Aided Design) Research Unit at California Polytechnic State University, which is developing software to automate the complicated and costly process of consultation and revision among architects, structural engineers and other specialists involved in home or office building design. The effort is being sponsored by computer companies, among them Accugraph Corporation, El Paso, Texas.

Under the direction of Dr. Jens Pohl, the CAD research team has developed a system called ICADS (Intelligence Computer Aided Design System). ICADS consists of a

number of expert systems developed through use of CLIPS.

ICADS is designed to run under Accugraph's MountainTop CAD and Graphic Information Management Software (*below*). MountainTop provides the graphics environment for ICADS. The electronic "experts" monitor the designs of the architect and offer suggestions, comments and information. Some of the experts that can be consulted under ICADS are a structural analyst, lighting expert, cost advisor and acoustical consultant. The experts advise the architect as he is designing, allowing him to avoid mistakes that could cause major revisions. Accugraph is planning to incorporate this form of artificial intelligence into future releases of MountainTop and CLIPS will be used to create the expert systems. •

\* COSMIC is a registered trademark of the National Aeronautics and Space Administration.



153